MAINTENANCE MANUAL

Laboratory Freeze Dryer CRYODOS

TELSTAR

CRYODOS_I_rev0105MA

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1. INTRODUCTION

The aim of a maintenance plan is to provide a guide for operating on all installed components that require maintenance.

The success of a maintenance plan basically depends on how detailed the information is and on the correct analysis of this information. The maintenance plan must therefore be an active document to be modified according to user requirements.

The maintenance plan sets out a series of inspections and operations that range from being carried out on a daily basis to up to once every six months. The corresponding information should be compiled and noted in detail in order to be of use for the following maintenance operations.

2. MAINTENANCE INSTRUCTIONS

WARNING

- Before beginning any maintenance operation or work on the freeze-dryer, disconnect it from the power supply.
- In general, a regular inspection of the correct operation of all the unit components should be performed once a year.

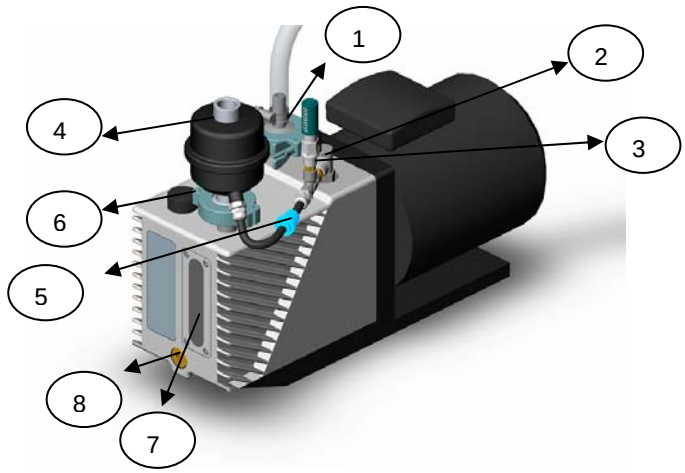
2.1. VACUUM UNIT MAINTENANCE

The revision and maintenance operations to be done in the vacuum unit are as follows:

2.1.1. INSPECTION OF OIL CONDITION

The visual inspection is performed through the sight glass (7). The pump must be switched off but at working temperature.

The usual state of the oil is normally clear and transparent. Oil draining and changing is recommended when it looks dirty or milky (water contaminated).



1.- Admission.
2.- Gas-Ballast.
3.- Gas-Ballast key.
4.- Oil filter (exhaust).
5.- Suck-back pipe.
6.- Filling cap.
7.- Sight glass.
8.- Emptying cap.

2.1.2. OIL LEVEL CONTROL

The correct level for oil is shown when it is seen half way up the sight glass (7). If it falls below this point, top up with the necessary amount through the filler hole when the pump is not running.

2.1.3. OIL CHANGE

This operation has to be done with pump switched off but at working temperature (the pump must have been running for at least 20 minutes to ensure proper viscosity of the oil).

To change vacuum pump oil proceed as follows:

1. Unscrew the emptying cap (8) and leave the dirty oil flow out. When there is any oil remaining, start up the vacuum pump for some seconds and stop it. Screw the emptying cap (8). **REMARK:** comply with current environmental standards and regulations when disposing of the used oils.
2. Take out the filling cap (6).

3. Pour new oil into the filling hole into the filling hole until the level is half way up the sight glass (7).
4. Screw the filling cap (6).

It is advisable to carrying out a periodic interior cleaning of oil and of pump body. To do this, first pour ¼ in the normal amount of oil for normal pump working, run the pump for 30 seconds to empty it out. Next repeat this operation with the same amount of oil and the same time, empty it out again and then pour in the final filling to half way up the level sight glass.

As the pump may be damaged by being idle for long periods with dirty oil in it, it is advisable to change the oil before the beginning of the idle period.

The recommended TELSTAR Oils are:

- **AV-30,** mineral oil for general industry and laboratory applications.
- **CHEMOIL-500,** specially designed for use at high temperatures.
- **WETOIL-8r,** specially designed for moisture absorbing applications.

Vacuum pump oil capacity: 0,5 litres.

2.1.4. CONTROL VISUAL DE PÉRDIDAS DE ACEITE

Make sure that there is no oil remaining around the vacuum pump. Presence of oil drops means oil loss through the seals, caps or level. Proceed to clean the area and locate the origin of the loss.

2.1.5. GAS BALLAST SITUATION

The gas-ballast (2) is placed in the suck-back pipe (5) communicating this pipe with the gas exhaust filter of the vacuum pump (includes a gas ballast key (3), that allows its regulation).

2.2. REFRIGERATING SYSTEM MAINTENANCE

The refrigerating system needs practically no maintenance. If, by accident or due to any refrigerating circuit damage, oil or cooling liquid has to be added, consult our technical service.

To ensure proper cooling of the refrigerating system, all the grids must beat a suitable distance from the equipment and the wall (minimum distance of 20 cm.).

Periodic cleaning away of dust accumulated in the cooling unit condensing battery at the back of the base unit is recommended. To clean this, the cover must be opened and a small paintbrush used to remove the dust. This should be done particularly before summer.

When the switch is off, the compressor continues working for the time set by the collecting timer (2 min.) in order to suck up the gas from the evaporator. If the compressor fails to stop after this period, the equipment must be inspected, as it is not good for the compressor to continue working without circulating gas.

Refrigerating loads:

	R-404a	R-23
CRYODOS-50	800 gr.	-----
CRYODOS-80	800 gr.	8 kg/cm^2

2.3. TECHNICAL ASSISTANCE PROGRAM

This is a menu incorporated in the equipment, which provides for come of the maintenance work.

WARNING ⚠

This program is only for maintenance and technical assistance tasks; it should never be used for normal equipment operations.

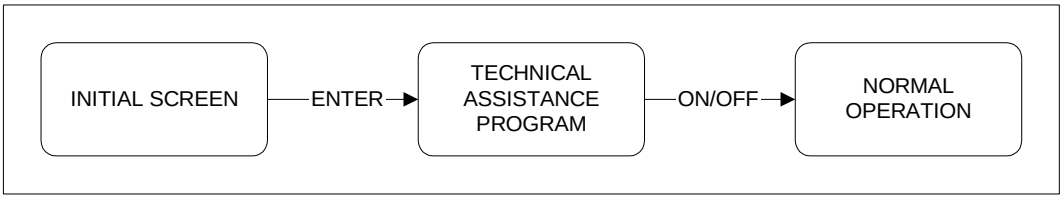
The Technical Assistance program provides for:

- Working on the vacuum unit independently.
- Working on the cooling unit independently.
- Setting to 0 /Resetting the timetable counters.
  - Vacuum Pump
  - Compressor E1
  - Compressor E2 (only CRYODOS –80)

To access the Technical Assistance Program, proceed as follows:

Switch on the equipment; the initial screen will appear, then hold the ENTER key during 10 seconds till access to the Technical Assistance Program. To exit and go back to the normal operation program, press the ON/OFF key.

Diagram

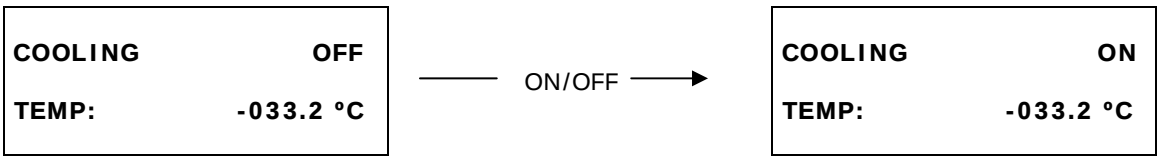


SCREENS

The Technical Assistance Program has several screens forming options viewed by use of the UP/DOWN keys.

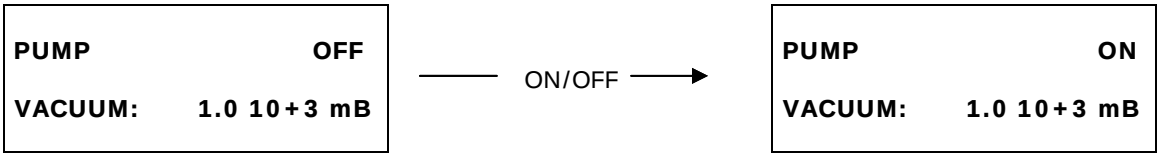
Cooling unit operation

This option provides for working independently on the cooling unit. The screen shows condenser temperature and whether the process is on “ON” or “OFF”.



Vacuum unit operation

This option provides for working independently on the vacuum unit. The screen shows the vacuum level and whether the process is running, “ON” or not, “OFF”.



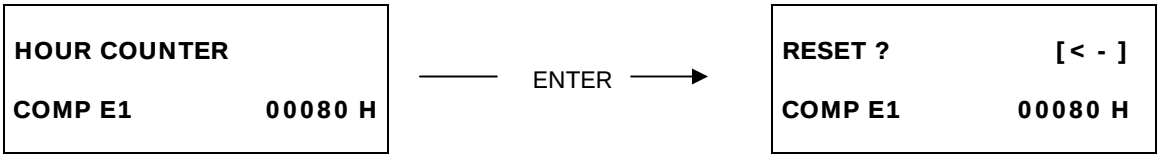
Resetting time counters

The time counters can be reset by pressing the ENTER key, giving access to the confirmation screen, and then pressing ENTER again. To leave the confirmation screen, press the UP/DOWN key.

If any other key is pressed, it will not reset.

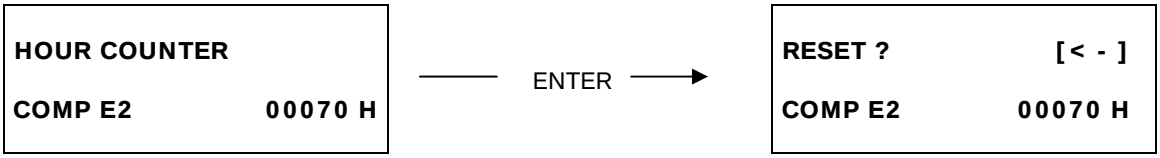
Compressor E1

This shows hours running of compressor 1 and provides for resetting them.



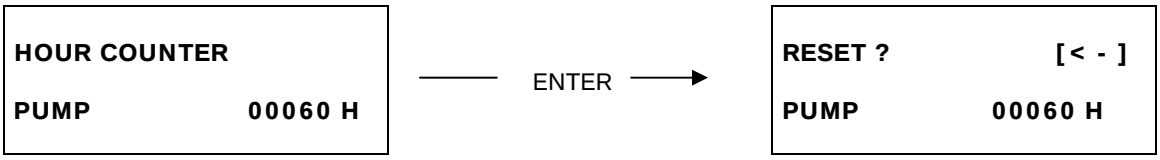
Compressor E2 (only for CRYODOS-80)

This shows hours running of compressor 2 and provides for resetting them.

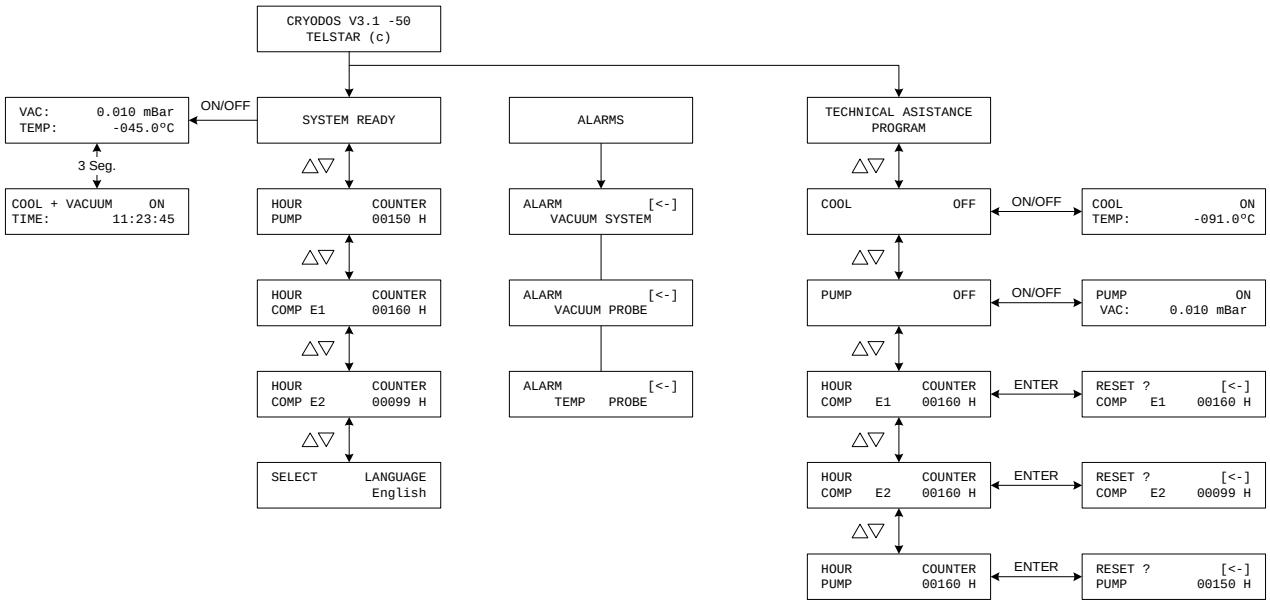


Vacuum pump

This shows pump running hours and provides for resetting them.



Working diagram



CRYODOS V3.1

2.4. MAINTENANCE CHART

The following frequencies for each task, and particularly that for oil changes, as shown on the Maintenance Chart below, are for guidance with normal freeze dryer work. Very severe work conditions may indicate a reduction of these intervals on the Chart.

OPERATION	*PERIODICITY*
VACUUM UNIT	
- Inspection of oil conditions	Before each operation
- Oil level control	Before each operation
- First oil change	After the first 150 hours of service
- Oil change	Minimum every 500 hours of service
- Check the performance of the vacuum unit, particularly the standard time for reaching vacuum throughout the unit using the cold condenser.	Every 6 months
- Visual inspection of oil loss	Every 6 months
REFRIGERATING UNIT	
- Cleaning of the condenser panel	Every 6 months
- Check the performance of the refrigerating system by comparing the standard chamber plate and condenser cooling times	Every 6 months
FREEZE DRYER	
- Seals cleaning and greasing	Every 6 months

3. TROUBLESHOOTING

3.1. VACUUM UNIT

Problem: The vacuum pump does not start.

CAUSE	SOLUTION
The pump motor is not receiving voltage	Check the pump's electrical terminals Check the corresponding circuit-breaker Check that the working temperature is not too high (>35ºC), as this might have caused the circuit breakage.
The pump's starter protector is blocked, as a result of the condenser not reaching the appropriate temperature.	Check that the condenser temperature is sufficient to permit the start-up of the vacuum pump.
Pump wheel seizure. The motor axis will not turn	Contact the Technical Assistance Department. Send the pump to TELSTAR for inspection

Problem: A vacuum cannot be obtained in the unit

CAUSE	SOLUTION
The motor turns but does not create a vacuum.	Motor/pump coupling broken. Send the pump to TELSTAR for inspection

Problem: The pump is not creating the maximum vacuum pressure.

CAUSE	SOLUTION
Lack of oil	Check the level of oil in the pump and add if necessary
Contaminated oil	Empty the oil from the pump and fill it with new oil

Problem: Abnormal pump heating

CAUSE	SOLUTION
Lack of ventilation or extremely high temperature (above 35ºC) in the pump area	Position of the vacuum pump in an area with better ventilation.

Problem: Mist leak from the emission channel

CAUSE	SOLUTION
Air ballast open too far	Close the air ballast
There is a leak in the unit	Locate the leak

3.2. REFRIGERATING UNIT

Problem: The refrigerating unit does not start

CAUSE	SOLUTION
The compressors are not receiving a voltage	Check the compressors' electrical terminals Check the circuit breaker corresponding to each compressor.

Problem: The chamber plates or the condenser are not reaching the minimum temperature.

CAUSE	SOLUTION
Refrigerant leak	Notify the TELSTAR Technical Assistance Department in order to locate the leak, repair it and load gas.
Lack or insufficient water supply	Verify water source and pressure.

Problem: Intermittent compressor stoppage.

CAUSE	SOLUTION
Insufficient refrigeration of the condensing component	Place the freeze-dryer in a better ventilated spot Check that the room temperature is below 24ºC Clean the area formed by the condensing component with compressed air and a brush Check that there is adequate circulation of fan forced air

Problem: The compressor stops after a series of intermittent stoppages

CAUSE	SOLUTION
Disconnection of the compressor motor thermal protector	Place the freeze-dryer in a better ventilated area Check that the room temperature is below 24ºC Clean the area formed by the condensing component with compressed air and a brush Check that there is adequate circulation of fan forced air Wait 30 minutes for the motor to cool down and for the protector to become unblocked in order for operation to resume.

3.3. FREEZE-DRYER ASSEMBLY

Problem: A working vacuum cannot be achieved in the chamber

CAUSE	SOLUTION
There is a leak in the unit	Check that the unit is watertight Lubricate the chamber and condenser joints with silicon Check that all the connection taps are closed. Check that the condenser discharge valve is closed Check that there is no condenser defrosts water remaining from the last operation in the discharge tube.

Problem: The vacuum gauge indicates gauge short circuit on the display

CAUSE	SOLUTION
Vacuum gauge short-circuit	Check wiring Replace the gauge

4. UNIT SPARE PART CODES

Only original parts and accessories will guarantee correct operation of the freeze-dryer.

4.1. VACUUM GROUP

DESCRIPTION	CODE
Vacuum Pump VARIAN DS 102	21978
Vacuum transducer	19658
Exhaust filter	91015
Silicone grease	4716
Fluid oil AV-30 for Vacuum Pump (1 litre)	15263
Set of gaskets for VARIAN DS 102 Vacuum Pump	23074

4.2. REFRIGERATING SYSTEM

DESCRIPTION	CODE
Refrigerating fluid R-404-A	12728
Refrigerating fluid R-23	70256
Compressor R-404 (-50)	3484
Compressor R-23 (-80)	3522
Compressor R-404 (-80)	3484

4.3. GENERAL

DESCRIPTION	CODE
Low condenser reservoir seal	60098
Top condenser reservoir seal	8652

5. MAINTENANCE RECORDS

5.1. TIME COUNTERS

Note down in the following tables the number of hours operated before resetting the time meters.

VACUUM PUMP

DATE	HOURS	OPERATION	DONE BY:

COOLING COMPRESSOR

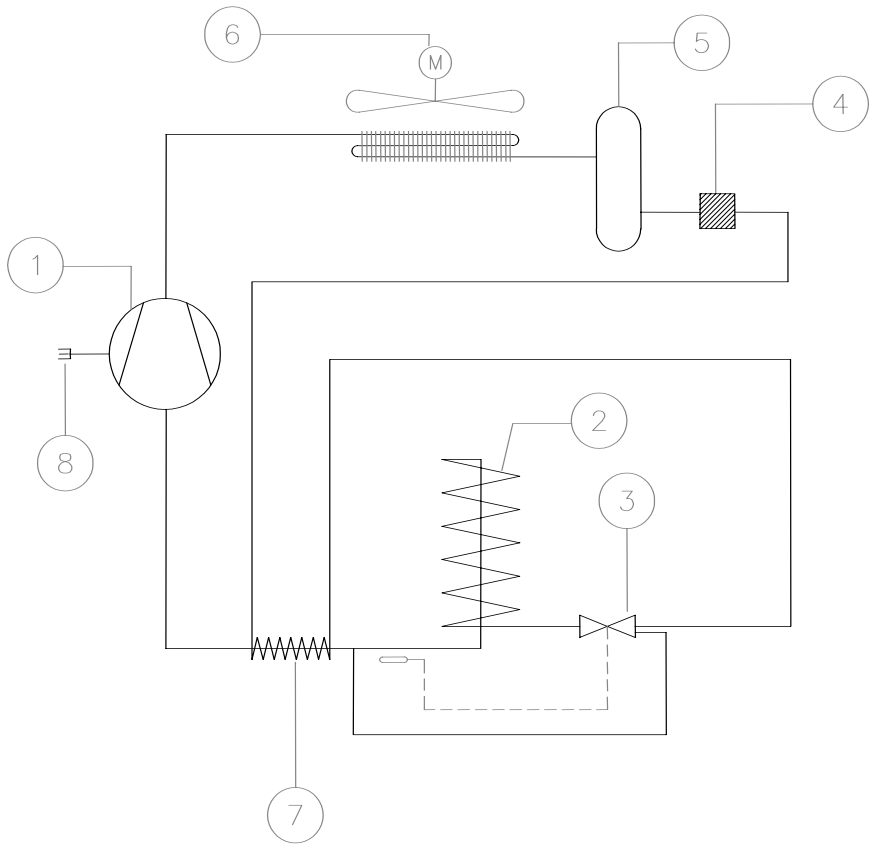
DATE	HOURS	OPERATION	DONE BY:

5.2. OTHER OPERATIONS

DATE	OPERATION	DONE BY:

6. ATTACHED DOCUMENTATION

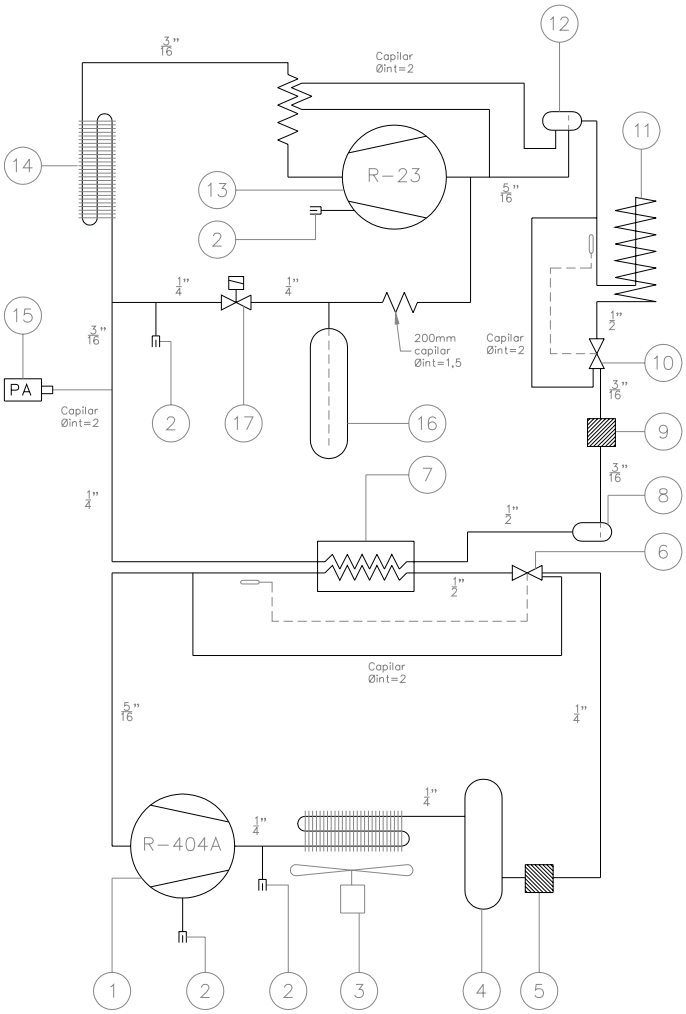
6.1. CRYODOS –50 REFRIGERATING SYSTEM P&ID



6.2. LEGEND. CRYODOS 50 REFRIGERATING SYSTEM

ID.	DESCRIPCIÓN	CODIGO
1	R-404-A Compressor	3484
2	Ice condenser	26844
3	Thermostatic valve R-404a	3485
4	Drying filter	3252
5	Refrigerating tank R-404a	7072
6	Condenser R-404a	3428
7	Exchanger heat	
8	Loading valve	3023

6.3. CRYODOS –80 REFRIGERATING SYSTEM P&ID



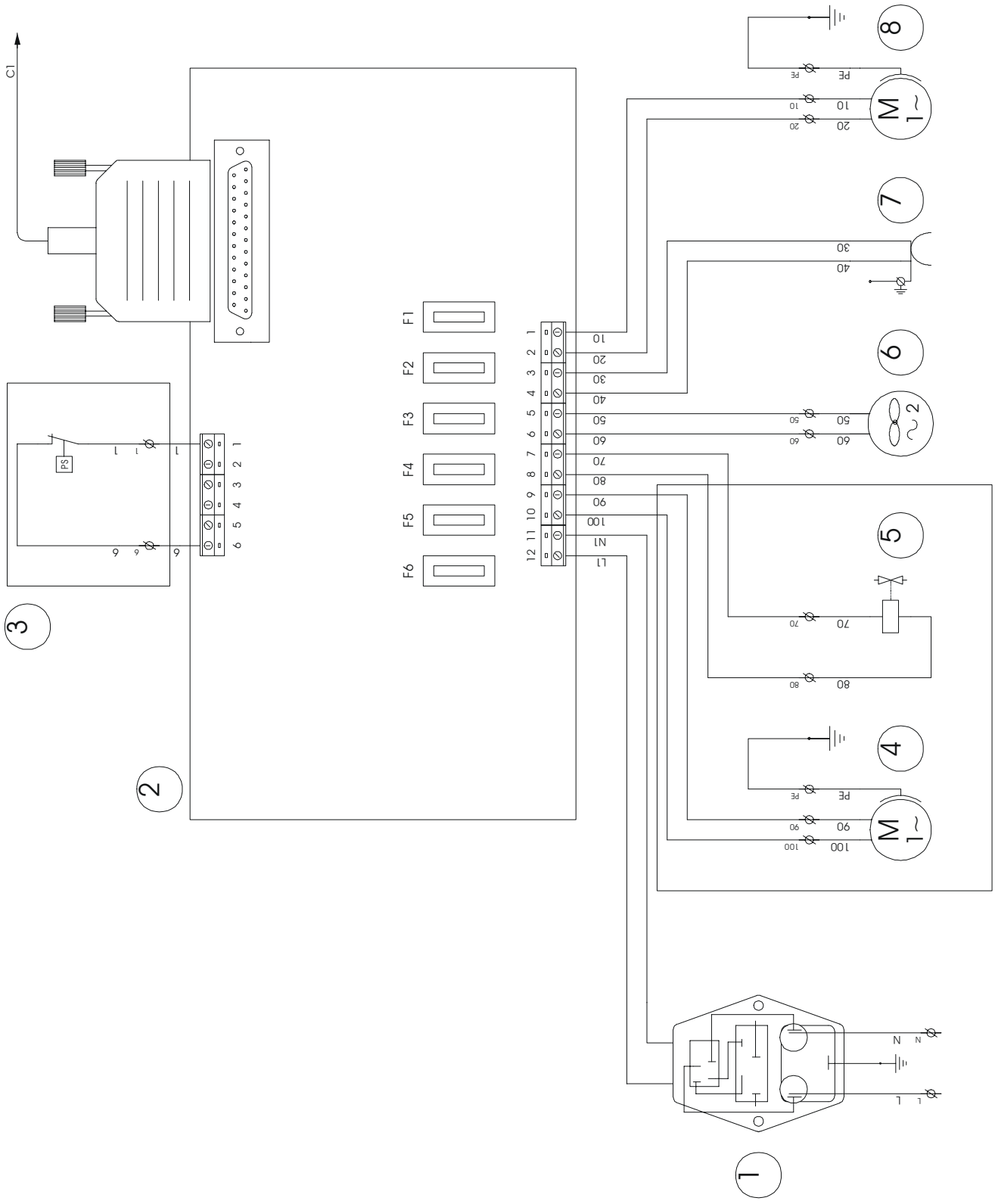
6.4. LEGEND CRYODOS –80 REFRIGERATING SYSTEM P&ID

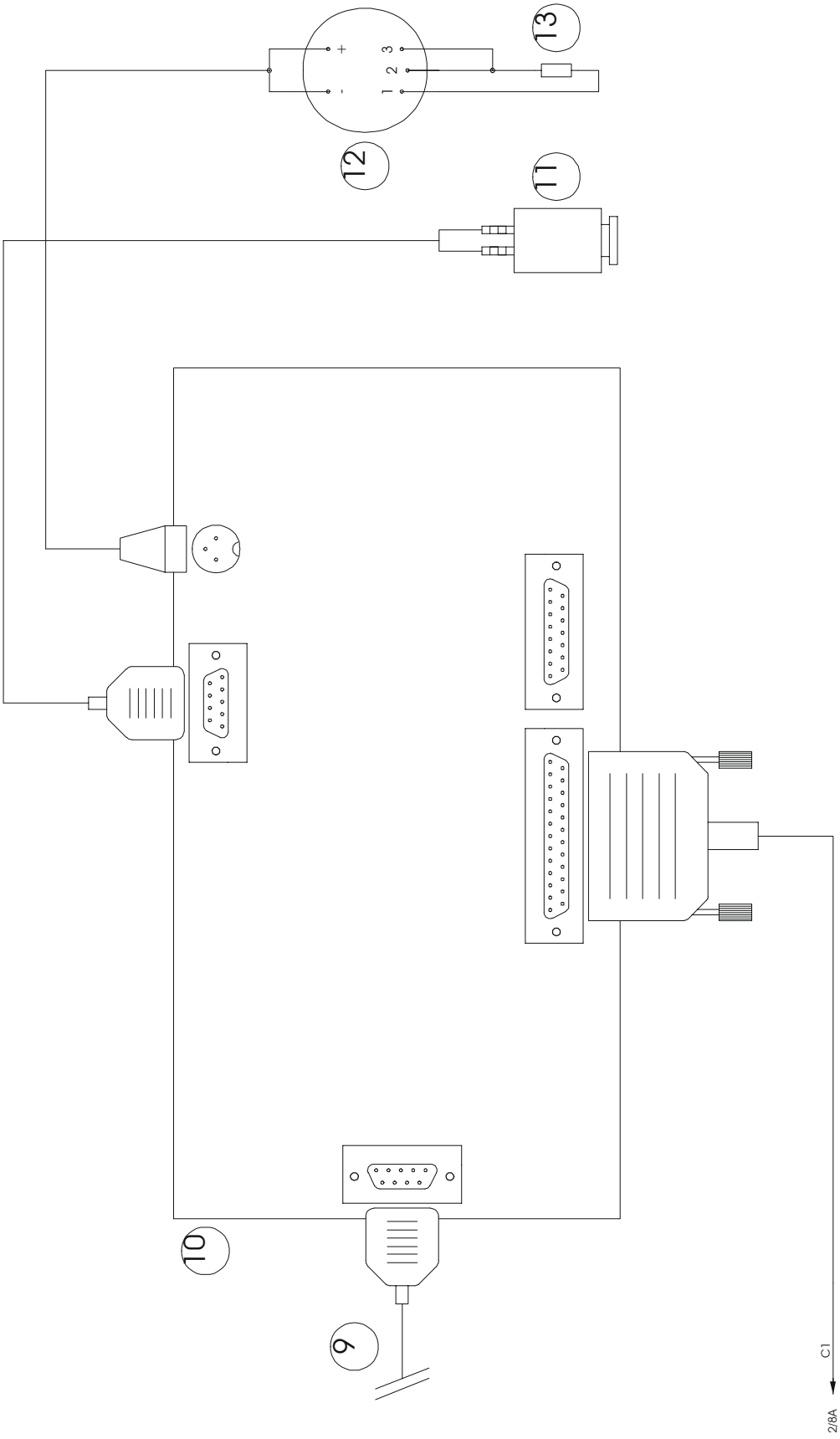
ID.	DESCRIPTION	CODE
1	Hermetic compressor R-404-a	3484
2	Loading valve	3023
3	Condenser R-404-a	3428
4	Refrigerating tank R-404-a	7072
5	Drying filter	19813
6	Thermostatic valve R-404-a	3485
7	Exchanger heat	19534
8	Liquid tank R-23	222718
9	Drying filter	19557
10	Thermostatic valve R-23	19657
11	Ice condenser	26844
12	Suction separator	26462
13	Hermetic compressor R-23	3522
14	Desuperheater	23438
15	High pressure switch	3514
16	Expansion tank R-23	3384
17	Electrovalve	3510

6.5. LEGEND OF CRYODOS ELECTRIC DIAGRAMS

ID.	DESCRIPTION	CODE
1	Filter FTO 6 A	70237
2	Card E/S	19074
3	High pressure switch R404	3514
4	Compressor R-23 (CRYODOS –80)	3522
5	Electrovalve (CRYODOS –80)	3510
6	Condenser fan	3428
7	Plug	1852
8	Compressor R404	3484
9	Lyologger connection(optional)	16965
10	Controller Cryodos	19073
11	Vacuum transducer	19658
12	Conversor Wika	21249
13	Temperature gauge PT100	20070
14	Input/output	
15	Configuration port CRYODOS	

6.6. ELECTRIC DIAGRAMS

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